Ameritec

30-0056

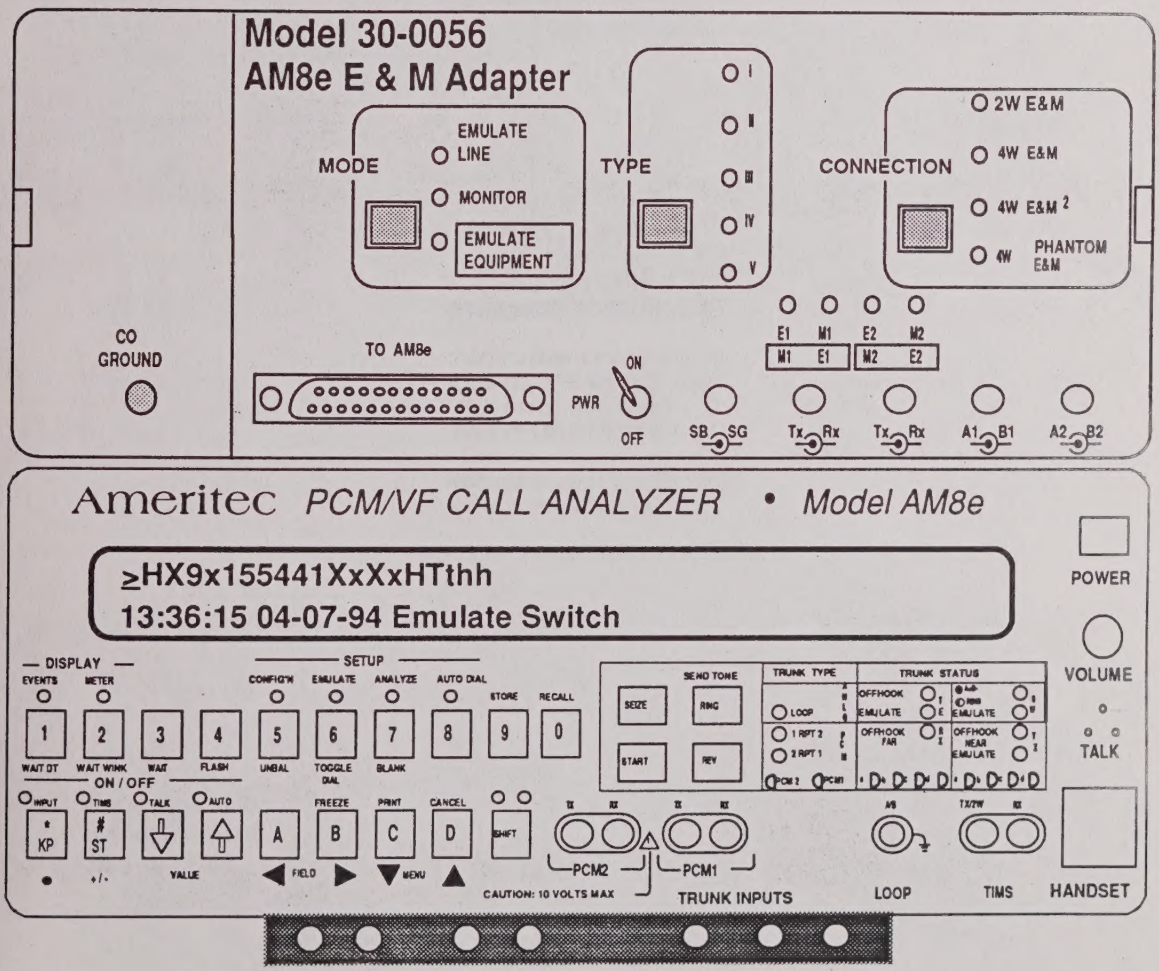
AMBE E+M OP/SV

18-0044

J.R. O'CONNOR

MODEL 30-0056
AM8e E&M ADAPTER
(for the Model AM8e PCM/VF CALL ANALYZER)

INSTRUCTION MANUAL



Ameritec CORPORATION

PN# 18-9944

MODEL 30-0056
AM8e E&M ADAPTER
(Used with MODEL AM8e PCM/VF CALL ANALYZER)

INSTRUCTION MANUAL

June 1995

Technical Data Subject to
Change without Notice

Ameritec
CORPORATION

760 Arrow Grand Circle
Covina, CA 91722 USA
TEL (818) 915-5441
FAX (818) 915-7181

We made our name with
American Technology

ISO 9001 Registered Company

For extra copies of this
manual, order Part
No. 18-0044

Record of Revisions

August 20, 1992	Preliminary Issue Revised Preliminary printings 9/23/92, 10/1/92
October 14, 1992	Original Release
May 3, 1993	Reprint. Minor formatting changes. Add type V to first two circuits in Figure 5.
January 26, 1994	Reprint. No changes.
April 7, 1994	Revision. New cover. Change page layouts and figure sizes for readability. Correct minor errors and spelling changes (e.g. "signalling" to "signaling")
5 June 1995	To printer. Revision. Updated logos.

TABLE OF CONTENTS

1. INTRODUCTION 1
   - 1.1 AMERITEC AM8e PCM/VF CALL ANALYZER 1
   - 1.2 AM8e MODEL 300056 E&M ADAPTER 2
   - 1.3 AM8e PROTOCOL TABLE DEVELOPMENT GUIDE AND DISK 2
   - 1.4 OVERVIEW OF E & M TEST CONFIGURATION 2

2. OPERATION OF THE E&M ADAPTER 4
   - 2.1 Front Panel Controls and Indicators 4
     - 2.1.1 PWR ON OFF — Power ON/OFF Switch 4
     - 2.1.2 MODE — Mode Selector switch 4
     - 2.1.3 MODE indicators — Mode-Selected Indicators 5
     - 2.1.4 TYPE — E&M Type-Select Switch 5
     - 2.1.5 TYPE Indicators — E&M Type Indicators 5
     - 2.1.6 CONNECTION — Connection-Type Switch 5
     - 2.1.7 CONNECTION indicators — Connection-Type Indicators 5
     - 2.1.8 E1 M1 and E2 M2 Indicators — Active status of E & M signals ... 5
   - 2.2 CONNECTION TO THE CALL ANALYZER 6
     - 2.2.1 TO AM8e —AM8e Interface Connection 6
   - 2.3 CONNECTIONS TO TEST LEADS 7
     - 2.3.1 SB SG Connection 8
     - 2.3.2 Tx Rx for E1 M1 8
     - 2.3.3 Tx Rx for E2 M2 8
     - 2.3.4 A1 B1 VF Connector 8
     - 2.3.5 A2 B2 VF Connector 8
     - 2.3.6 CO GROUND TERMINAL 8
   - 2.4 SETTING THE OPERATING CONDITIONS 10
   - 2.5 REMOTE CONTROL OF E & M ADAPTER 11
     - 2.5.1 Remote Setup (ADP command) 11
     - 2.5.2 Remote Status (RADP command) 11
   - 2.6 CALL ANALYZER DISPLAY AND BIT INDICATORS 12

3. E & M SIGNALING DESCRIPTION 13
   - 3.1 CONNECTION TYPES 14
     - 3.1.1 2-wire E&M 14
     - 3.1.2 4-wire E&M 14
     - 3.1.3 4 Wire E&M² 14
     - 3.1.4 Phantom E&M 14

3.2 E & M TRUNK TYPES 16
3.2.1 E&M TYPE I 16
3.2.2 E&M TYPE II 16
3.2.3 E&M TYPE III 18
3.2.4 E&M TYPE IV 18
3.2.5 E&M TYPE V 18

APPENDIX A Analog R2 Monitoring A1

LIST OF ILLUSTRATIONS

Figure 1 — 4-Wire or 2-Wire E & M Circuit Overview 3
Figure 2 — Model 300056 AM8e E & M Adapter Front Panel 4
Figure 3 — Cables for AM8e E & M Adapter Front Panel Connectors 7
Figure 4 — AM8e E & M Adapter Front Panel Connections 9
Figure 5 — E & M Connection Diagrams 15
Figure 6 — E & M Trunk Type Connections 17

LIST OF TABLES

Table 1 — E & M Lead Signaling Conventions 17

(END TABLE OF CONTENTS)

1. INTRODUCTION

This manual is intended for use with the Ameritec Model 300056 AM8e E&M Adapter (P/N 300056). This manual should be used in conjunction with the AM8e PCM/VF Call Analyzer Instruction Manual (P/N 180035), and the AM8e Protocol Table Development Guide (P/N 180040).

This manual is divided into 4 major sections, as listed in the Table of Contents. This first introductory section provides an overview of the AM8e VF Call Analyzer, AM8e E & M Signaling Adapter, and Protocol Table Development Guide; all of which are of fundamental importance to the instructions in this manual.

The second section describes the Model 300056 AM8e E&M Adapter, its front panel, and connections.

The third section is an overview of the characteristics of the various E & M connections and signaling types.

1.1 AMERITEC AM8e PCM/VF CALL ANALYZER

The Ameritec AM8e PCM/VF Call Analyzer is a test set that is designed to emulate, monitor, and analyze signaling activity at the PCM interface point on an established connection.

> *NOTE: For brevity, the AM8e PCM/VF Call Analyzer will be referred to as the "Call Analyzer" in the remainder of the text..*

The Call Analyzer can emulate or monitor and identify activities at the near end (Tx) or far end (Rx) of either of two 2.048 Mbps PCM spans. This unit is described in the "Model AM8e PCM/VF Call Analyzer Instruction Manual" (P/N 180035).

Tests can be performed on any of 30 voice channels on the spans, and the Call Analyzer may operate with any selection of one of eight signaling protocols.

Up to eight protocols may be loaded into the Call Analyzer, either from the factory or by a user with an MS/DOS Compatible PC. The user may develop custom protocols to conform to local standards, as described in the "AM8e Protocol Table Development Guide".

Although the Call Analyzer can be used to test an analog loop circuit, it is not specifically designed for direct connection to analog lines using E&M Signaling conventions; therefore, Ameritec has developed the Model 300056 E&M Adapter.

1.2 AM8e MODEL 300056 E&M ADAPTER

The Model 300056 AM8e E&M Adapter is physically designed to replace the front cover of the Call Analyzer. The illustration on the cover of this manual shows both units as they would be set up for use.

> *NOTE: For brevity, the Model 300056 AM8e E & M Signaling Adapter will be referred to as the "E & M Adapter".*

The E & M Adapter is electrically connected to the Call Analyzer via a ribbon cable from a "TO AM8e" connector on its front panel to the LINE/TIMS connector on the rear panel of the Call Analyzer. All power and PCM2 input and output connections between the E & M Adapter and the Call Analyzer are via this connector.

The interfaces between the E & M signaling and VF circuits are via bantam jacks on the front panel of the E & M Adapter.

Functionally, the E & M Adapter is an Analog to Digital/ Digital to Analog signal converter which converts an E&M Signal from its line or equipment interface at a Central Office to 2.048Mbps PCM Rx and Tx Signals which are processed by the Call Analyzer. This allows the Call Analyzer to Emulate or Monitor either the near-end (Tx) or far-end (Rx) signaling on an E&M interface. The user must select PCM2 as PCM input.

1.3 AM8e PROTOCOL TABLE DEVELOPMENT GUIDE AND DISK

The AM8e Protocol Table Development Guide (P/N 180040) is a user's guide to developing custom signaling protocols for the AM8e on an MS/DOS-compatible Personal Computer. Also included with the Guide is a Development Disk which must be used together with third-party software as described in the Guide. Custom protocols are required for E & M monitoring and emulation.

In many cases, Ameritec has developed protocols which may be supplied to the user on a disk (or provided with the Call Analyzer). For example, "E & M_ADAPT" (9220040-PP) will enable the Call Analyzer to be used with the E & M Adapter. Other protocols are listed in an Addendum to the Guide (P/N 180126). For more information contact your local Ameritec Sales or Instruments Group representative.

1.4 OVERVIEW OF E & M TEST CONFIGURATION

Figure 1 shows the interfaces between terminal signaling equipment and a Central Office Switch trunk interface using 2-Wire E & M, 4-Wire E & M, or 4-Wire, E & M^2 connections (upper illustration) and 4-Wire phantom E & M (lower illustration). This figure illustrates the positions of the E & M Signaling Adapter to emulate or monitor the terminal or switch. Both commonly-used circuit identifications "(T), (R), (T1), (R1), (E), (M)" and E & M Adapter signal labelling on the front panel "A1, B1, A2, B2, E1, M1" are shown in this illustration.

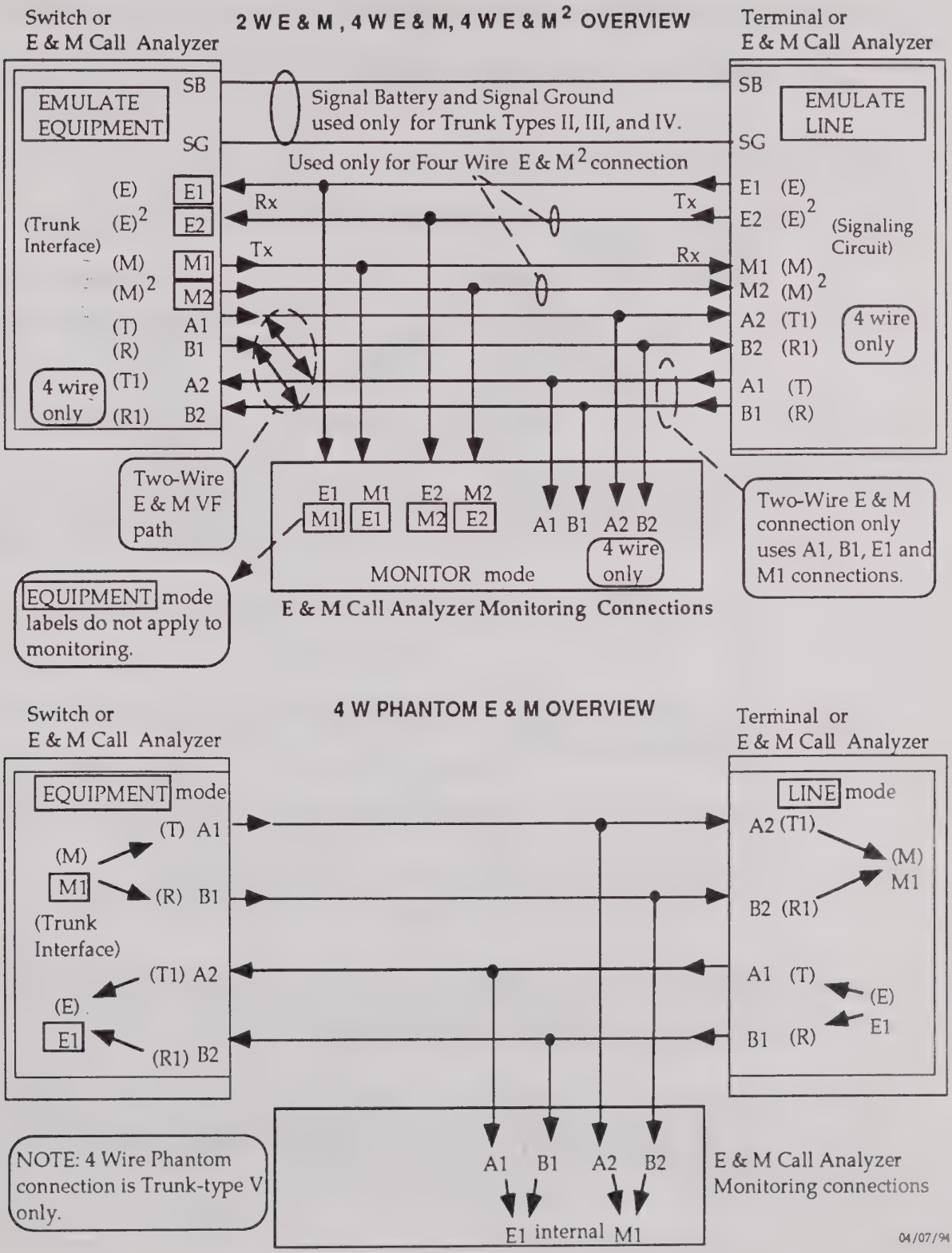


Figure 1 — 4-Wire or 2-Wire E & M Circuit Overview

2. OPERATION OF THE E&M ADAPTER

2.1 Front Panel Controls and Indicators

Figure 2 shows the front panel of the E & M Adapter. The figure identifies the sub-section number descriptions which follow.

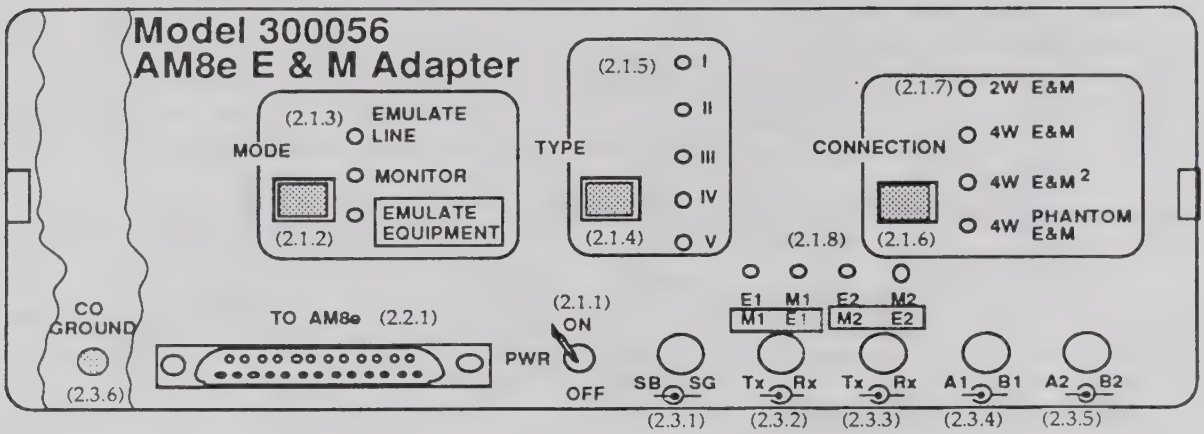


Figure 2 — Model 300056 AM8e E & M Adapter Front Panel

2.1.1 PWR ON OFF — Power ON/OFF Switch: This switch allows the user to turn the power on and off.

NOTE: Power (+16V) is provided by the Call Analyzer which must also be turned ON. The cable between the Call Analyzer and the AM8e E & M Signaling Adapter must also have been connected (Refer to 2.2.1).

2.1.2 MODE — Mode Selector switch: This switch allows the user to emulate either a switch/trunk interface (equipment) or a signaling circuit (line) location, or to monitor the connection between locations.

The user may change the defined mode by pressing the mode switch to step to the next mode until the desired mode is reached. Possible Modes indicated on the panel are **EMULATE LINE, MONITOR,** and **EMULATE EQUIPMENT.**

2.1.3 MODE Indicators — Mode-Selected Indicators: These indicators display the selected mode. As the user changes modes the indicators change. The illuminated LED indicates the current mode of operation.

2.1.4 TYPE — E&M Type-Select Switch: This switch allows the user to select the E&M type that is active. Each press of the switch selects, in rotation, the 5 common E&M types. For further description of each of the E & M types, refer to Section 3.

2.1.5 TYPE Indicators — E&M Type Indicators: These LED's indicate which of the five common E&M types **(I, II, III, IV, or V)** has been selected.

2.1.6 CONNECTION — Connection-Type Switch: This switch allows the user to select between E&M Connection Types. Each press of the switch selects, in rotation, the four common line connection types. For further description of the E & M connections, refer to Section 3. The types selected are

2Wire E&M	(See 3.1.1)
4Wire E&M	(See 3.1.2)
4Wire E&M2	(See 3.1.3)
4Wire PHANTOM E&M	(See 3.1.4)

2.1.7 CONNECTION indicators — Connection-Type Indicators: These LED's indicate to the user the connection type that has been selected.

2.1.8 E1 M1 and E2 M2 Indicators — Active status of E & M signals: - These LED's display the status of the E&M signaling leads on the Tx and Rx jacks below them. When lighted, they indicate that the signal is present.

NOTE: When EMULATE EQUIPMENT is selected, the functions of the jacks and indicators are reversed. This is signified within the rectangular marking surrounding (MODE:) "EMULATE EQUIPMENT "and "M1 E1" and "M2 E2" on the front panel.

2.2 CONNECTION TO THE CALL ANALYZER

2.2.1 TO AM8e — AM8e Interface Connection: This is a DB-25 male connector, shown in Figure 2, where the 25-pin female connector of Cable 48015600 (supplied with the unit) is connected.

The other end of this cable has a 24-pin ribbon connector which connects to the LINE/TIMS connector on the rear panel of the Call Analyzer. The signals provided from the Call Analyzer are as shown below:

SIGNAL	PIN
LID–R	9
LID–T	10
LID–R1	11
LID–T1	12
CO GROUND	15
CO GROUND	16
CO GROUND	21
CO GROUND	22
+ 16 volt power	23
+16 volt power	24

CAUTION: Power should be turned OFF on the AM8e before making this connection.

CAUTION: When using the LINE/TIMS jack as a connection point from the Call Analyzer to the CO for LOOP or PCM signals (when not using the E & M Adapter) ; BE SURE THAT PINS 23 and 24 are NOT connected to CO ground.

(These connections were not provided in early Call Analyzers, and Figure 7-18 in the Model AM8e PCM/VF Instruction Manual (March 1992 issue) shows pins 9 - 11 as unused, and pins 23 and 24 as extra CO GROUNDS.)

2.3 CONNECTIONS TO TEST LEADS

Connections for the E & M signaling, ground, battery, and VF interfaces may be made with any of the three types of cables which have a bantam connection on one end and a bantam plug, type 310 plug, or clip leads on the other. Figure 3 shows these cables. An additional single conductor is required to connect the CO GROUND.

Figure 4 is a detailed illustration of the jacks on the E & M Signaling Adapter. The figure further shows the E & M, VF, SG and SB leads as if cables with clip leads were connected to the jacks.

Signaling leads are identified as they would appear on the clip leads when the appropriate MODE, TYPE, and CONNECTION are selected. Further information on the jacks is provided in the subsections which follow.

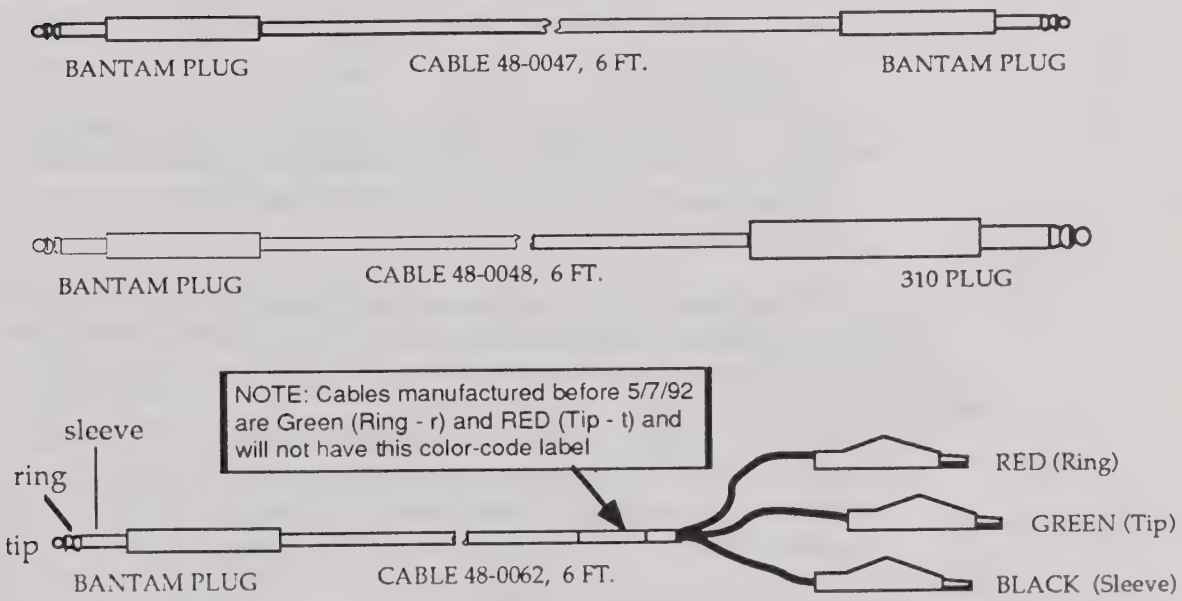


Figure 3 — Cables for AM8e E & M Adapter Front Panel Connector

2.3.1 **SB SG Connection:** This is a bantam jack for connection to the line Signal Battery (SB) and Signal Ground (SG). SB is on the tip conductor; SG is on the ring conductor. CO Ground is on the sleeve conductor. This connection is used only for E & M trunk types II, III, and IV.

2.3.2 **Tx Rx for E1 M1:** This is a bantam jack for connection to the E1 and M1 leads. The status of these signaling leads is indicated by the E1 and M1 indicators directly above the connection. For MODE MONITORING and EMULATE LINE, E1 is on the tip conductor; M1 is on the ring conductor. When the unit is set to MODE, EMULATE EQUIPMENT, the connections are reversed. These leads are used for all connection and trunk types except 4W Phantom E & M.

2.3.3 **Tx Rx for E2 M2:** This is a bantam jack for connection to the E2 and M2 leads. These leads are used only for 4 Wire E&M2 connection type (in addition to the E1 M1 leads, described above). The status of these signaling leads (when used) is indicated by the E2 and M2 indicators directly above the connection. For MODE, MONITORING AND EMULATE LINE, E2 is on the tip conductor; M2 is on the ring conductor. When the unit is set to MODE, EMULATE EQUIPMENT, the connections are reversed.

2.3.4 **A1 B1 VF Connector:** This is a bantam jack connection for the 4W Transmit or 2W Transmit/Receive VF leads. The tip (or A1) is on the tip conductor; the ring (or B1) is on the ring conductor.

> *NOTE: In EMULATE LINE or EQUIPMENT, signal flow is out of the E & M Adapter. When in MONITOR mode, this jack must be connected to the A1 and B1 (transmit) leads from the terminal (line).*

2.3.5 **A2 B2 VF Connector:** This is a bantam jack connection to the Receive VF leads. These leads are used (in addition to the A1 B1 leads) with 4 Wire E&M, 4W E & M2, and 4W Phantom E & M connections.

> *NOTE: In EMULATE LINE or EQUIPMENT signal flow is into the E & M Adapter. When in MONITOR mode, this jack must be connected to the A2 and B2 (receive) leads to the terminal (line)..*

2.3.6 **CO GROUND TERMINAL:** This is a yellow binding post located at the left end of the Adapter. It should be used to connect the Central Office ground to the adapter. (A similar binding post on the back of the AM8e VF/PCM Call Analyzer may also be used.) The binding post is recessed so that there will be no interference when the Adapter is secured to the front of the AM8e VF/PCM Call Analyzer for carrying or storage.

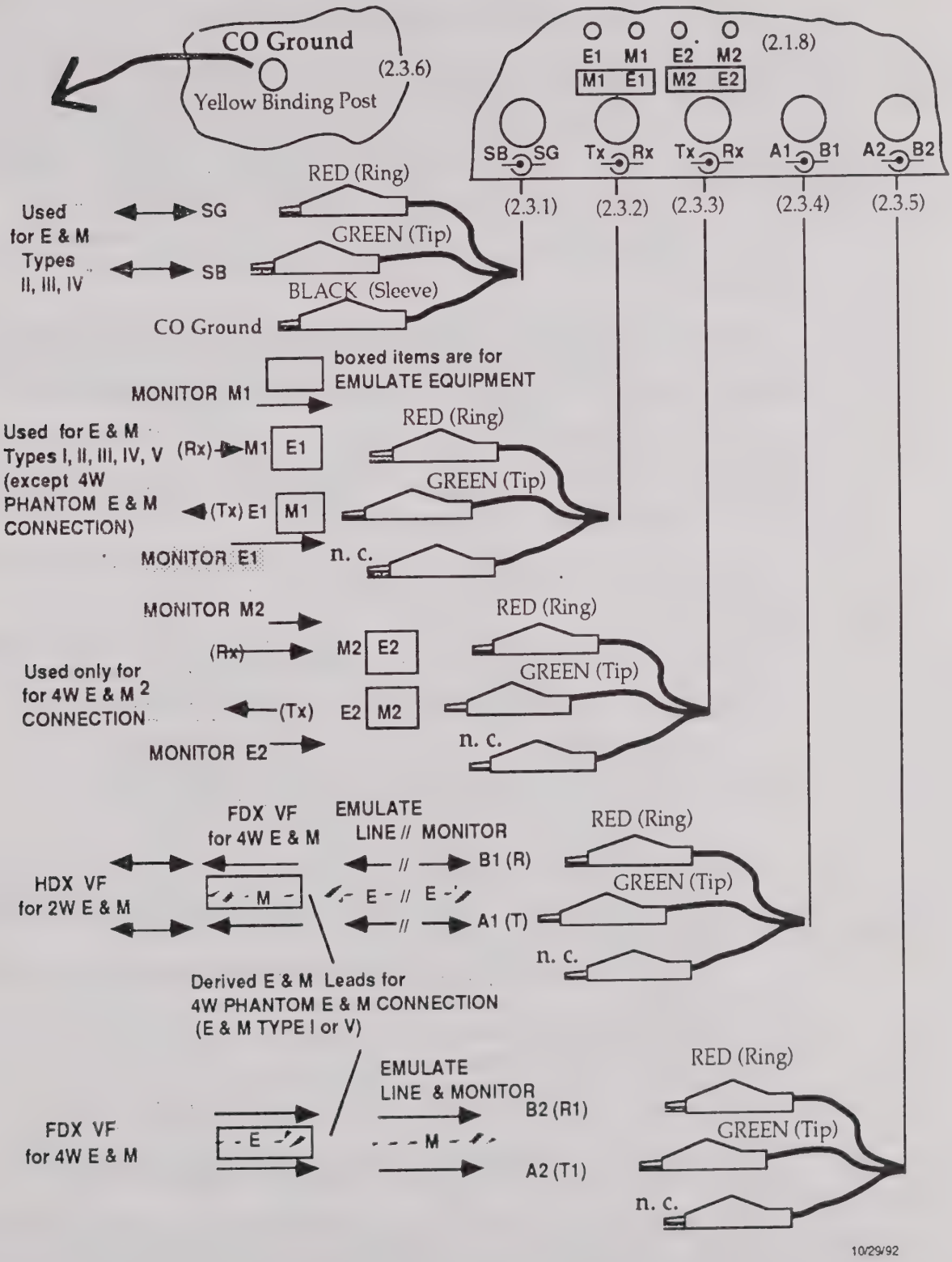


Figure 4 — AM8e E & M Adapter Front Panel Connections

2.4 SETTING THE OPERATING CONDITIONS

Both the Call Analyzer and E & M Adapter must be configured correctly for the mode and an appropriate protocol must be selected in the Call Analyzer. This protocol must be designed for translating the incoming PCM signal from the E & M Adapter into Call Analyzer events or for translating the Call Analyzer events into a PCM signal that the E & M Adapter will convert into E, M, and VF signals at the user's equipment. The basic steps for setting up, connecting, and using the E & M Adapter follow:

1. Remove the Signaling Adapter from the front of the Call Analyzer by opening the holding clips on either side, and set it on top of or beside the PCM/VF Call Analyzer.

2. After verifying that the Call Analyzer is turned OFF, connect the 48015600 Ribbon Cable (supplied) between the "TO AM8e" connector on the Signaling Adapter and the LINE/TIMS connector on the PCM/VF Call Analyzer.

3. Make the appropriate connections for the E & M test configuration. Refer to Figures 1, and 3 - 6 and accompanying descriptive text. For emulation, disconnect through- connections (if not done by test jacks at the CO). For monitoring, leave the connections in place.

4. Turn ON the Call Analyzer and the E & M Adapter, and verify that the PWR indicator on the E & M Adapter is lighted.

5. Set the both units to match (The E & M adapter may be set directly through the front panel MODE, TYPE, and CONNECTION switches, previously described, or remotely through AM8e commands as described in sub-section 2.5).

E & M Adapter	Call Analyzer
EMULATE LINE	MODE– emulate
EMULATE EQUIPMENT	MODE– emulate
MONITOR	MODE– monitor.

6. Also set the following Call Analyzer parameters:

IMITATE —	te/line or switch (not significant for PCM operations)
ANALOG/PCM –	pcm int clk
PROTOCOL –	for the E & M requirements at the test location.
INPUT –	PCM2
Channel —	1

7. Set the correct TYPE of E&M for the equipment under test.

8. Set the correct CONNECTION type for the equipment under test.

9. To set up other parameters and perform tests, follow the procedures in the Model AM8e PCM/VF Call Analyzer Instruction Manual (18-0035).

Note: The E & M Protocol may automatically set the Call Analyzer parameters. If you have any further questions in setting up the test configuration, applications help is available from 8 AM to 5 PM Pacific Time by contacting Customer Service at the address or phone numbers on the title sheet of this manual.

2.5 REMOTE CONTROL OF E & M ADAPTER

The E & M Adapter may be set directly through the use of the front panel MODE, TYPE, and CONNECTION switches or remotely through a terminal connected to the Call Analyzer's RS232 port. A command is used for setting each switch, and another command is used to read the conditions that have been set up.

2.5.1 Remote Setup (ADP command): Each E & M Adapter switch can be set remotely through the use of the following command:

(ADP=xyz) x must be 1 for E & M Adapter

y = switch

z= switch selection as shown below:

if y	then z
0 = MODE	0 = EMULATE LINE 1 = MONITOR 2 = EMULATE EQUIPMENT
1 = TYPE	0 = I 1 = II 2 = III 3 = IV 4 = V
2 = CONNECTION	0 = 2W E & M 1 = 4W E & M 2 = 4W E & M2 3 = 4W PHANTOM E & M

As an example, three commands would be required to place the E & M Adapter into monitor mode, for a type III, 4 wire E & M connection:

(ADP=101) (ADP=112) (ADP=121)

2.5.2 Remote Status (RADP command): The settings of the E & M adapter switches can be read remotely through the use of the following command and response:

command	response
(RADP)	ADAPTER STATUS = m t c (as shown below:)

m = MODE	t = TYPE	c = CONNECTION
0 = EMULATE LINE 1 = MONITOR 2 = EMULATE EQUIPMENT	0 = I 1 = II 2 = III 3 = IV 4 = V	0 = 2W E & M 1 = 4W E & M 2 = 4W E & M2 3 = 4W PHANTOM E & M

As an example, the status for the monitor mode, type III, 4 wire E & M connection:

(RADP) ADAPTER STATUS=121

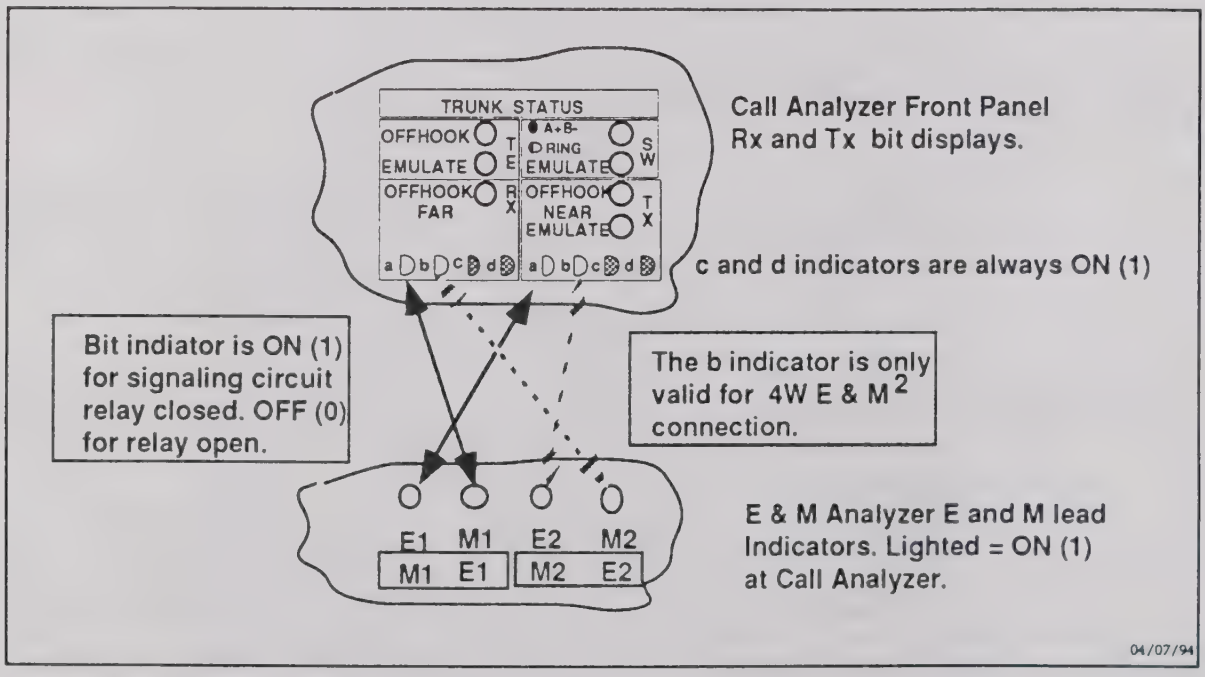
2.6 CALL ANALYZER DISPLAY AND BIT INDICATORS

When the E & M Adapter and Call Analyzer are processing calls, both the display and the bit indicators (LEDs) on the Call Analyzer front panel provide call information. The display and bit indicators may be read locally or by remote control, as desired. Refer to the AM8e PCM/VF Call Analyzer Instruction Manual for information on the front panel and Remote Control.

Events and details are displayed on the Call Analyzer in accordance with the protocol that is used.

The "Tx" and "Rx", "a" and "b" bit indicators on the Call Analyzer monitor the states of the E & M type indicators (refer to 2.1.5). The "c" and "d" indicators are always set to 1 (ON). .

The following diagram shows the relation between the E and M signals as displayed on the front panel of the E & M Adapter, the "a" and "b" indicators on the Call Analyzer front panel, and the open or closed states of the signaling relays (described in sub-section 3.2/Figure 6 illustrations of E & M Trunk Types).


TRUNK STATUS
OFFHOOK
EMULATE
T E
A+B-
RING
EMULATE
S W
OFFHOOK FAR
R X
OFFHOOK NEAR EMULATE
T X
a b c d
a b c d
Call Analyzer Front Panel Rx and Tx bit displays.
c and d indicators are always ON (1)
Bit indiator is ON (1) for signaling circuit relay closed. OFF (0) for relay open.
The b indicator is only valid for 4W E & M 2 connection.
E1 M1 E2 M2
M1 E1 M2 E2
E & M Analyzer E and M lead Indicators. Lighted = ON (1) at Call Analyzer.
04/07/94

When monitoring the Rx and Tx indications with a remote terminal, the E & M protocol will normally use channel 1. All other channels will be inactive. (Refer to Figure 7-10 in Call Analyzer Instruction Manual.)

3. E & M SIGNALING DESCRIPTION

E & M Signaling is a type of DC signaling interface between switching equipment and transmission equipment. It is used in conjunction with VF signaling lines (A1, B1, A2, and B2) and, for some E & M types, ground and battery lines.

By changing the voltage level or ground/open circuit conditions on the E & M leads, (depending on type) information may be transferred between the switching equipment and the transmission equipment such as seizure of circuit, seize-acknowledgement, circuit release, dial pulsed digits, etc.

The way in which signals are applied to the leads allows each lead to have the same name on both ends of the physical connection between the switching equipment and the line and permits a tip-tip and ring-ring patching configuration.

The E & M Adapter follows these conventions:

- From the switching equipment point of view, the "M" lead typically transmits either a ground or battery condition to the transmission equipment while the "E" lead typically receives either open or ground signals from the transmission equipment.

  Therefore, the front panel of the AM8e E & M Adapter is marked to show this signal direction for the E and M leads for LINE or EQUIPMENT emulation. (MONITOR is the same as LINE).

- From the transmission equipment point of view, the "M" lead typically receives either open or ground signals from the line equipment, while the "E" lead typically transmits either a ground or battery condition to the switching equipment. A second set of markings on the front panel shows these signal directions.

- When the unit is monitoring "E" is assumed to be a signaling output, and M is assumed to be a signaling input.

3.1 CONNECTION TYPES

The E & M Adapter provides for the four basic E & M connection types. These are illustrated in Figure 5. (Figure 1 also illustrates connection of an E & M Adapter and Call Analyzer.)

- 2-wire E&M: E1, M1, A1 (tip), B1 (ring)
- 4-wire E&M: E1, M1, A1 (tip), B1 (ring), A2 (tip1), B2 (tip2).
- 4-wire E&M²: E1, M1, E2, M2, A1 (tip), B1 (ring), A2 (tip1), B2 (ring 2).
- 4-wire E&M Phantom: A1, B1, A2, B2. (E-lead signals are carried via the A1 B1 lines, while M-lead signals are carried via the A2, B2 lines.
- In addition to the VF and DC signaling lines, SB (signal battery) and SG (signal ground) leads are used in E & M types II through IV to supply battery and ground signal levels between the signaling ends. (Refer to sub-section 3.2 for the ways in which these leads are used)

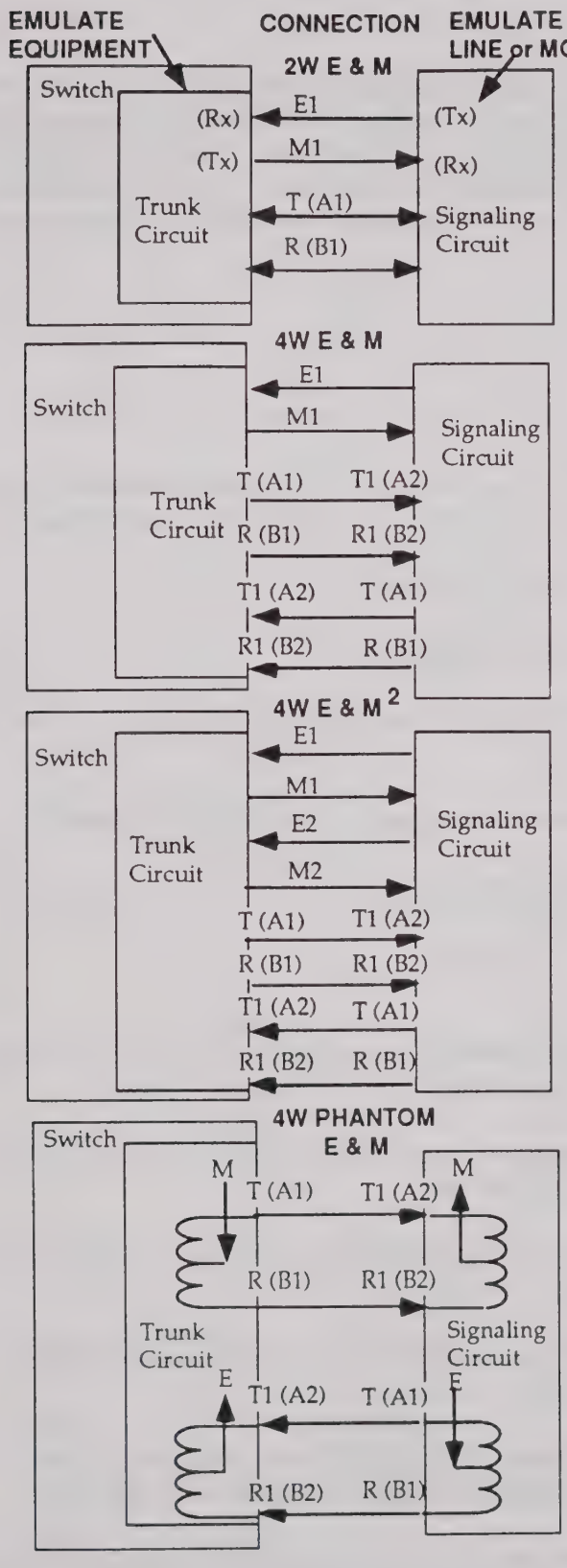
3.1.1 **2-wire E&M:** A1 and B1 are bi-directional (half-duplex), acting as both send and receive for VF signals including voice, DTMF signaling, and MF signaling. The E and M leads send and receive DC signaling voltages in accordance with the E & M type. SB and SG leads are used in types II through IV.

3.1.2 **4-wire E&M:** A1 and B1 are uni-directional, handling only VF send signals. A2 and B2, are also uni-directional, handling only VF receive signals (a full-duplex configuration). The E & M leads send and receive signaling voltages in accordance with the E & M type. SB and SG leads are used in types II through IV.

3.1.3 **4 Wire E&M²**: A1 and B1 and A2 and B2 are also full duplex for VF signaling. There are two sets of E & M leads which allow DC signaling from both ends simultaneously. This is a Type V interface which does not require SB or SG leads.

3.1.4 **Phantom E&M**: A1 and B1 and A2 and B2 are full duplex for VF signaling. Physical E & M connections are not required because the circuit ends are terminated by center tapped transformers. This configuration is also sometimes called a "derived circuit". The connection to E, and M circuits is made via transformer center taps within the equipment (and the E & M analyzer). Phantom E & M can only be used with type V connection because there is no way to transport the SB and SG leads through the derived circuit.

- When in emulate line mode, the E signal is sent via the A1 and B1 leads while the M signal is received via the A2 and B2 leads.
- When in emulate equipment mode, the M signal is sent via the A1 and B1 leads while the E signal is received via the A2 and B2 leads.
- When in monitor mode, the E signal can be monitored via the A1 and B1 leads, and the M signal can be monitored via the A2 and B2 leads.



MODE Setting on E & M Adapter if it is substituted for (or monitors) the circuit.

TYPE I and V shown. Refer to Figure 6 for ground and battery application to E & M lines and for use of SB and SG leads for **TYPEs II, III, and IV.**

TYPE I and V shown. Refer to Figure 6 for ground and battery application to E & M lines and for use of SB and SG leads for **TYPEs II, III, and IV.**

TYPE V only. Refer to Figure 6 for application of Ground and Battery to E and M leads.

TYPE I or V only. Refer to Figure 6 for application of Ground and Battery to E and M leads.

04/07/94

Figure 5 — E & M Connection Diagrams

3.2 E & M TRUNK TYPES

There are five different types of E & M trunk signaling methods (identified by Roman numerals I, II, III, IV, and V) which are in common use. The types differ mainly in the way Battery and Ground are supplied to the E & M leads. Table 1 summarizes these differences for ON HOOK and OFF HOOK conditions. Figure 6 shows simplified schematic diagrams for each type. Sub-sections 3.2.1 through 3.2.5 describe each type.

3.2.1 **E&M TYPE I:** The Type I interface is the original E&M Interface. Signaling on the M lead is from the trunk equipment to the transmission equipment.

Battery is supplied for Off-Hook condition.

Ground is supplied for On-Hook condition.

The E lead is used for signaling from the transmission equipment to the trunk equipment.

Local transmission equipment facility ground is used for Off-Hook,

Open circuit is used for On-Hook.

3.2.2 **E&M TYPE II:** The Type II interface (as well as Types III and IV) makes use of two additional leads, SB (Signal Battery) and SG (Signal Ground).

In the Type II interface, battery voltage is supplied to the trunk equipment by the signaling equipment on the SB lead.

The Trunk equipment signals the signaling equipment by opening and closing a connection between SB and the M lead.

The effect is that the trunk equipment signals the signaling equipment with battery for Off-Hook and open for On-Hook.

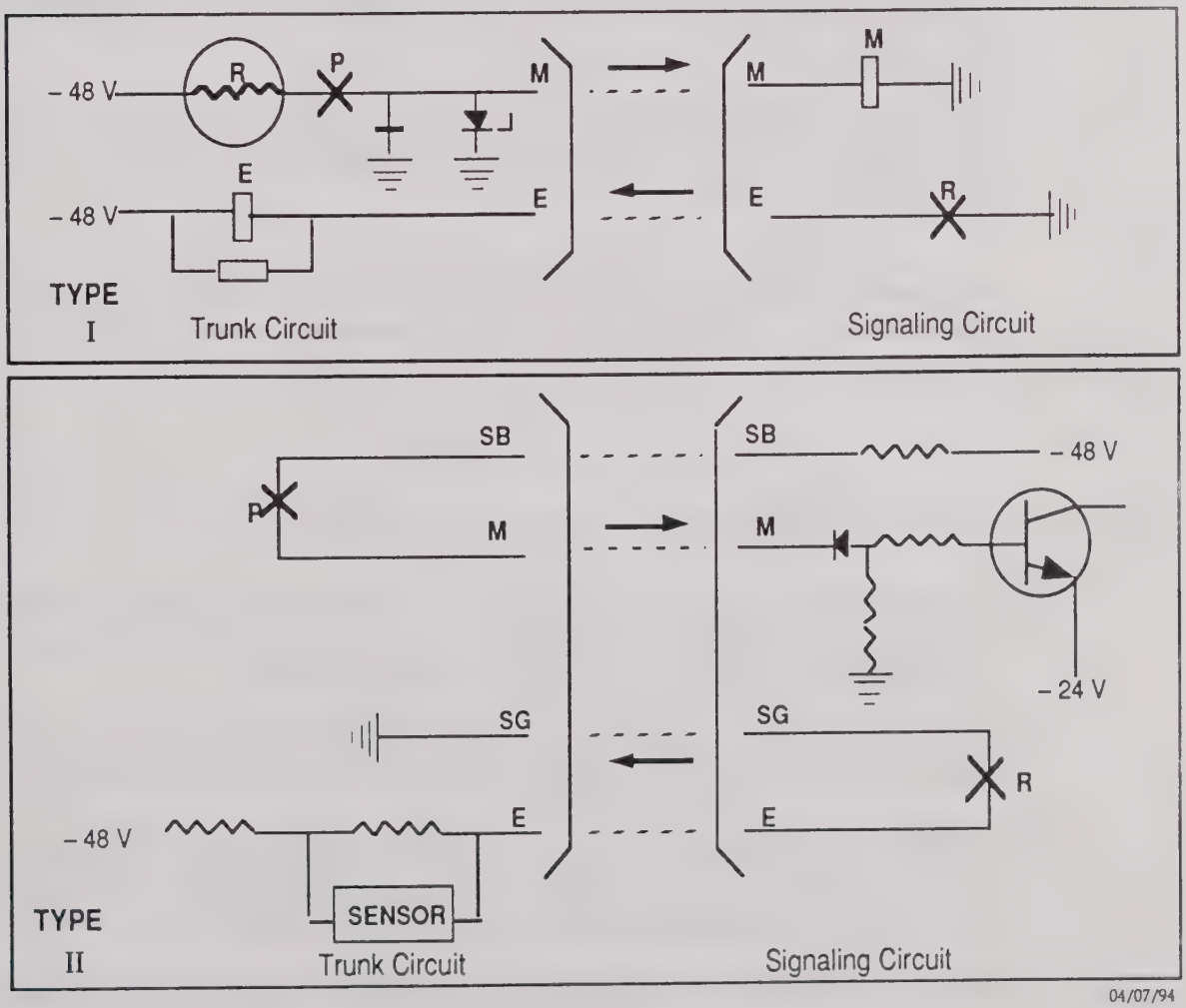
Signaling from the signaling equipment to the trunk equipment is accomplished by opening and closing a connection between the E lead and ground.

The effect is to signal from the signaling equipment to the trunk equipment with open for On-Hook and ground for Off-Hook.

Table 1 — E & M Lead Signaling Conventions

	TRUNK TO SIGNALING CIRCUIT			SIGNALING TO TRUNK CIRCUIT		
TYPE	LEAD	ON-HOOK	OFF-HOOK	LEAD	ON-HOOK	OFF-HOOK
I	M	Ground	Battery	E	Open	Ground
II	M	Open	Battery	E	Open	Ground
III	M	Ground	Battery	E	Open	Ground
IV	M	Open	Ground	E	Open	Ground
V	M	Open	Ground	E	Open	Ground

04/07/94



04/07/94

Figure 6 — E & M Trunk Type Battery and Ground Connections (Sheet 1 of 2)
(Sheet 2 of Figure 6 follows description of Types III, IV, and V)

3.2.3 **E&M TYPE III:** The Type III interface is essentially the same as the Type I interface in that signaling on the M lead is with battery for Off-Hook and ground for On-Hook.

The difference between Types I and III is that with Type III signaling Battery and Ground used for signaling on the M lead are supplied to the trunk equipment on the SB and SG leads respectively.

3.2.4 **E&M TYPE IV:** The signaling used with the Type IV interface is essentially the same as the Type II interface. The difference is in that with Type IV signaling the SB lead is grounded in the signaling equipment, and battery is supplied to the M lead.

The trunk circuit provides a path for the battery to ground by closing the contacts between M and SB. The effect is to signal with open for On-Hook and ground for Off-Hook.

The E lead is used to signal from the signaling equipment to the trunk equipment by closing contacts between E and SG in the signaling equipment. The effect is to signal using open for On-Hook and ground for Off-Hook.

3.2.5 **E&M TYPE V:** Type V is not used in the North American Network, but is the most common E&M Type outside of North America. Like the Type I interface the Type V interface does not use the SB and SG leads.

The difference from type I is that with Type V signaling battery is supplied to the M lead on the signaling equipment side instead of the trunk equipment side.

The trunk equipment signals to the signaling equipment by closing contacts to local ground thereby providing a path for the battery to ground on the M lead. The effect is to signal using open for On-Hook and ground for Off-Hook.

The trunk circuit provides battery to the E lead. Signaling on the E lead is from the signaling equipment to the trunk equipment by closing contacts from the signaling equipment E lead to local ground. The effect is to signal using open for On-Hook and ground for Off-Hook.

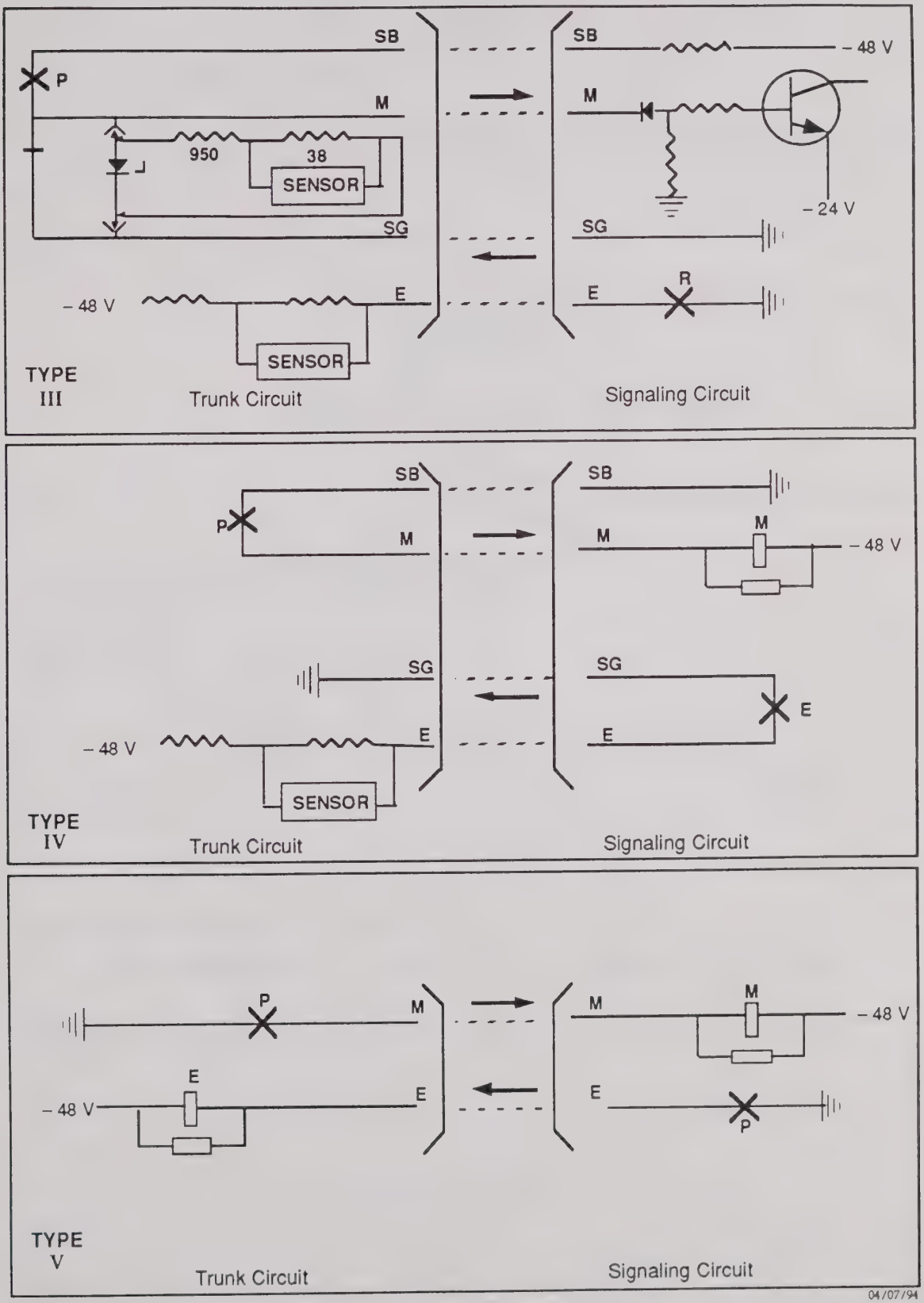


Figure 6 — E & M Trunk Type Battery and Ground Connections (Sheet 2 of 2)

(This Page Intentionally Blank)

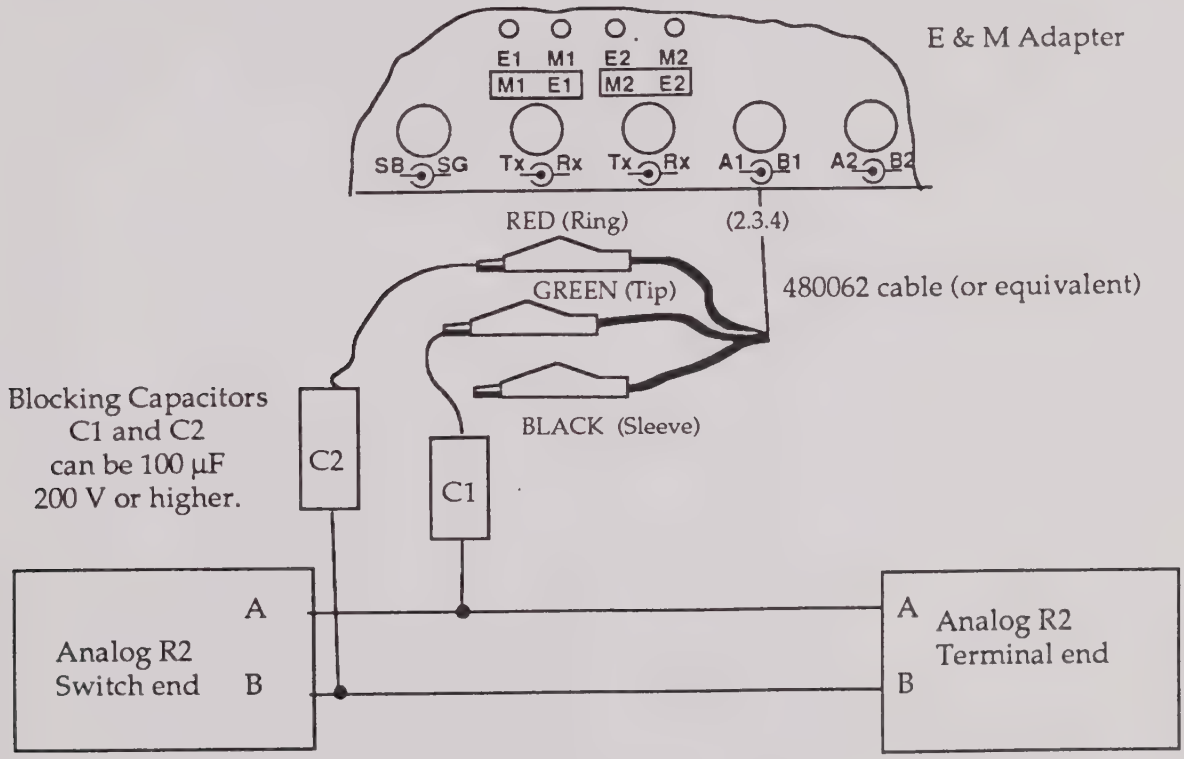
(End Of Instruction Manual)

APPENDIX A

A.1 Analog R2 Monitoring in AM8e

The user can monitor the R2 digit in 2-wire (loop) Analog circuits by connecting the analog circuit to the A1 B1 leads of the E & M Adapter. None of the other leads are used in this configuration.

A diagram of the configuration follows.



Set the switches on the E & M Adapter as follows:

MODE: MONITOR **TYPE: V** **CONNECTION: 2W E & M**

Set the Call Analyzer as described in sub-section 2.4. Protocol selected must have been designed for Analog R2 Monitoring.

(END OF APPENDIX A)

Ameritec
CORPORATION

760 ARROW GRAND CIRCLE • COVINA, CALIFORNIA 91722 USA • TEL. 818-915-5441 • FAX: 818-91

ACCOPRESS®

25001	BLACK
25002	LIGHT BLUE
25003	DARK BLUE
25004	LIGHT GRAY
25005	LIGHT GREEN
25006	DARK GREEN
25007	TANGERINE
25008	RED
25009	EXECUTIVE RED
25000	YELLOW

GENUINE PRESSBOARD

ACCO INTERNATIONAL INC.
CHICAGO, ILLINOIS 60619

www.manualsplus.com
1016650